PBS CAD Standards

For preparing drawings with computer-aided design software

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U.S. General Services Administration
Public Buildings Service National CIFM Center
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CHAPTER 1
GENERAL INFORMATION

1. Purpose.

   a. This handbook is for PBS contractors, customers, and employees. It sets mandatory, PBS-wide standards for preparing drawings and assignment plans with computer-aided design (CAD) software.

   b. These standards follow the *U.S. National CAD Standard* (NCS). The NCS was authored by various professional and Government groups including the:

      American Institute of Architects (AIA), *CAD Layer Guidelines*
      Construction Specifications Institute (CSI), *Uniform Drawing System (UDS)*
      Tri-Service and U.S. Coast Guard, *Plotting Guidelines and Attributes*

   c. Production of the NCS was based on a Memorandum of Understanding among the above groups and the National Institute of Building Sciences (NIBS), Sheet Metal Contractors Association (SMACNA), and U.S. General Services Administration (GSA). It is strongly recommended that PBS contractors refer to or obtain a copy of the NCS or its component documents. These will prove to be a helpful resource for PBS contracts as well as other work. See CHAPTER 5—RESOURCES for contact information.

2. Applicability. These standards are applicable to all PBS facilities and regions. Deviations are prohibited unless the contractor submits a written Deviation Request. See CHAPTER 5—RESOURCES. The Regional CIFM Program Manager must approve all requests. The contractor shall maintain a record of all approved deviations and include them with the final submittal.

3. Ownership. The Government, for itself and such others as it deems appropriate, will have unlimited rights to all information and materials developed under this contract and furnished to the Government. This includes any documentation thereof, reports and listings, and all other items pertaining to the work and services pursuant to this agreement, including any copyright. Unlimited rights under this contract are rights to use, duplicate, or disclose data and information, in whole or in part in any manner and for any purpose whatsoever without compensation to, or approval from, the Contractor. The Government will, at all reasonable times, have the right to inspect the work and will have access to, and the right to, make copies, of the above-mentioned items. All digital files, associated data and other products generated under this contract shall become the property of the Government.

CHAPTER 2
SOFTWARE ENVIRONMENT

1. Approved software.

   a. The contractor is responsible for any modifications required to make software comply with PBS standards.

   b. Approved PBS software products are as follows:

      CAD SOFTWARE
      Autodesk AutoCAD
      Autodesk AutoCAD LT

      CAD APPLICATION SOFTWARE
      Autodesk Softdesk family of AEC add-ons
      Autodesk AutoCAD Architectural Desktop
      Autodesk AutoCAD Land Development Desktop
      CADPlus InfoEngine

      LIBRARY SOFTWARE
      Documentum EDMS 98

      VIEWING SOFTWARE
      Cyco AMView
      Autodesk Volo View

      CAFM SOFTWARE
      Facility Information Systems FIS

      GIS SOFTWARE
      ESRI ArcView, Map Object
      Autodesk AutoCAD Map, MapGuide

      CMMS SOFTWARE
      PSDI Maximo
      DataStream MP2

      OFFICE SOFTWARE
      Microsoft Office Professional

   c. The Regional CIFM Program Manager must approve the use of software employing objects (such as Architectural Desktop or Land Development Desktop) before the start of preparing any project drawings. If such use is approved, the CIFM Program Manager and contractor shall work together to determine submissions requirements. All blocks must be AutoCAD native blocks and must be easily editable with AutoCAD “straight out of the box.”

2. Versions. The contractor shall submit data in either the most current, publicly available version of above listed software or one release prior provided that it is compatible with the current version used by PBS. The contractor shall be responsible for software and data upgrades throughout contract lifecycle. The contractor will consult with the Regional CIFM Program Manager to confirm software versions prior to all submissions. Note: the current version employed by PBS is AutoCAD Release 14.

3. File format.

   a. AutoCAD *.dwg format is the only acceptable format for CAD drawings. Drawings will be submitted in AutoCAD and all entities will be native to AutoCAD. Do not translate files using the Drawing Exchange Format (*.dxf) or International Graphics Exchange Specification format (*.iges).

   b. When scanned images are required, they may be in the following raster formats: *.gif, *.gp4 (CALS), *.jpg, *.tga, or *.tif.

CHAPTER 3
DRAWING SETUP AND CONVENTIONS

1. File scheme. Following AIA organizing concepts, PBS uses two distinct types of CAD files: model files and sheet files.

   a. File types.

      (1) Model files describe the building's physical layout and components. They can be floor plans, elevations, details, schematic diagrams, etc. Model files are drawn full size in model space. They can be 2D or 3D drawings. Model files do not include title blocks. Note: schematic diagrams may be drawn at any scale.

      (2) Sheet files are used to assemble model files for plotting and viewing purposes. In most instances, each sheet file represents one plotted drawing. Every sheet file has a drawing area, title block, and border. Use standard American National Standards Institute (ANSI) architectural or metric sheet sizes. The maximum sheet size shall not exceed 36" x 48". Sheet files shall be assembled in paper space, and set up to be plotted at 1" = 1" (plotscale=1) scale.

   b. File structure.

      (1) The typical multiple file approach using model and sheet files is illustrated below. Usually model files are Xref'd into the sheet file's model space. The tile block is drawn in model space, but inserted (or Xref'd) into the sheet file's paper space. **Caution:** PBS assignment drawings employ a different file structure using nested Xrefs. This structure is described in the *PBS Assignment Drawing Guidance.* Contractors hired to prepared assignment drawings will be given this Guidance to follow.

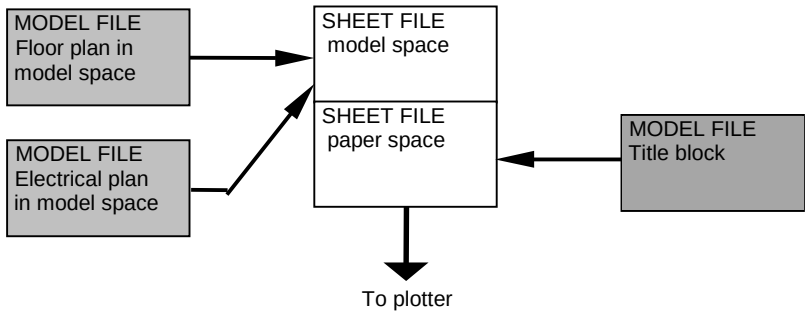


Figure 3-1. Typical file structure.

      (2) Title block and sheet layout. Ensure that title block and sheet layout follow PBS's schematic recommendations. See CHAPTER 5—RESOURCES. These are based on the CSI *Uniform Drawing System.* Some PBS regions have prepared standard title block and sheet layout formats that will be given to the contractor for their use. Please consult with the Regional CIFM Program Manager.

   c. File naming. PBS file naming conventions follow AIA guidelines for naming files. Naming guidelines are given for model and sheet file names.

      (1) Model file names. Model file names consist of a discipline designator, followed by a two-letter model file type, followed by a two-character floor number. Use of a two-character user definable field is optional. As an example of a model file name, A-FP01

would be the architectural, first floor plan. Note: the table below reflects some changes made by the NIBS *U.S. National CAD Standard* (first edition) to AIA and CSI conventions. For model file names for assignment drawings, refer to the *PBS Assignment Drawing Guidance.*

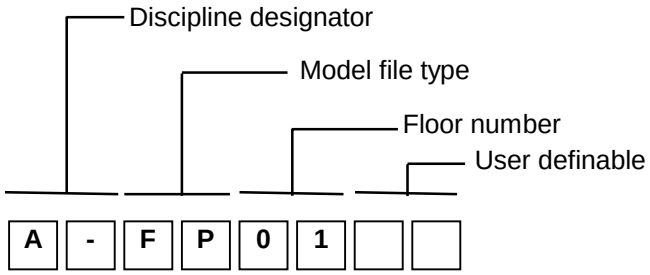


Figure 3-2. Model file names.

Discipline designator (two-character field with second character as a hyphen)

G	General
H	Hazardous materials
C	Civil
L	Landscape
S	Structural
A	Architectural
I	Interiors
Q	Equipment
F	Fire protection
P	Plumbing
M	Mechanical
E	Electrical
T	Telecommunications
R	Resource
X	Other disciplines
Z	Contractor/shop drawing
V	Survey/mapping
W	Civil work
B	Geotechnical
D	Process
O	Operations (includes facility and assignment drawing)

Floor number

01-99	First to 99th floor
M1	Mezzanine
P1	Penthouse
B1	Basement

Note 1: if more than one, use increment number on mezzanines, penthouses, and basements.
Note 2: floor type code may not apply to all drawings, especially details.

Model file type (apply to all disciplines)

*-FP	Floor plan	*-EL	Elevation
*-DP	Demolition plan	*-SC	Section
*-SP	Site plan	*-DT	Detail
*-QP	Equipment plan	*-SH	Schedule
*-XP	Existing plan	*-3D	Isometric/3D
*-RO	Roof plan	*-DG	Diagrams

Model file type (discipline specific)

Civil

C-EP	Environmental plan
C-GP	Grading plan
C-RP	Road/topographic plan
C-SV	Survey
C-UP	Utility plan

Structural

S-FP	Framing plan
S-NP	Foundation plan

Architectural

A-EP	Enlarged plan
A-CP	Ceiling plan
A-RP	Furniture plans
A-NP	Finish plans

Interiors

I-EP	Enlarged plans
I-CP	Ceiling plans
I-RP	Furniture plans
I-NP	Finish plans

CAFM (assignment plan only)

O-KY	Key drawing
O-SR	Source drawing

Fire protection

F-KP	Sprinkler system
*-VP	Evacuation plan

Plumbing

P-PP	Plumbing plan

Mechanical

M-CP	Control plan
M-HP	HVAC ductwork
M-PP	Piping plan

Electrical

E-LP	Lighting
E-PP	Power
E-GP	Grounding
E-CP	Communications

Telecommunications

T-TP	Telecommunications

(2) Sheet file names. Sheet file names consist of the discipline designator, followed by the sheet type designator, followed by the sheet sequence number. Use of a three-character user definable field is optional. The sheet file name corresponds to the sheet number. For example, A-101.dwg would be the sheet file name for sheet number A-101. The sheet number will appear in the Sheet Identification area of the Title Block.

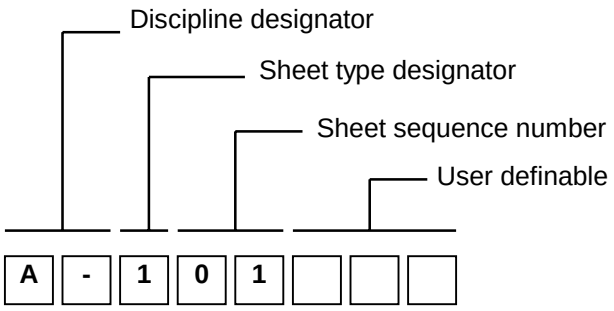


Figure 3-3. Sheet file names.

Discipline designator (two-character field with the second character as a hyphen)

G	General
H	Hazardous materials
C	Civil
L	Landscape
S	Structural
A	Architectural
I	Interiors
Q	Equipment
F	Fire protection
P	Plumbing
M	Mechanical
E	Electrical
T	Telecommunications
R	Resource
X	Other disciplines
Z	Contractor/shop drawings
V	Survey/mapping
W	Civil work
B	Geotechnical
D	Process
O	Operations (includes facility and assignment drawings)

Sheet type designator (one number field)

0	General (symbols, legends, notes, etc.)
1	Plans (horizontal views)
2	Elevations (vertical views)
3	Sections (sectional views)
4	Large scale (plans, elevations, or sections that are not details)
5	Details
6	Schedules and diagrams
7	User defined
8	User defined
9	3D Views (isometric, perspectives, photographs)

Sheet sequence number (two-character field designated sequentially starting at 01 and continuing through 99)

Sheet sequence numbers tie directly to both the discipline and sheet type designators, for example A-202 would be the second architectural elevation sheet in the drawing set.

2. Drawing standards.

a. Accuracy and PBS reference drawings**.**

(1) Contractors are responsible for the accuracy of all CAD drawings delivered to PBS. For all drawing entities, zero tolerance is required, all lines meet at intersections, straight lines are straight, blocks are inserted properly without overlap, etc.

(2) PBS may provide contractors with existing CAD drawings for convenience, however, these drawings shall be used as a base reference only. Unless otherwise specified by the contracting documents, the contractor is responsible for field verification of existing conditions, and ensuring that all-electronic documents submitted comply with standards.

b. Attributes. Do not use attributes to store large amounts of data or types of data that are better stored in external databases. However, some PBS regions use attributes to store title block information. These attributes allow for automatic population of the EDMS system without hours of manual input. Please consult with the Regional CIFM Program Manager.

c. Blocks.

(1) Any graphic entity that occurs repeatedly in drawings should be made into a block. Insertion points for each block shall be consistent with its placement in the drawing. Use logical insertion points such as the center of circle, bottom left corner of object, etc. Keep names simple and descriptive.

(2) Nested blocks are permitted but should be avoided whenever possible. If custom nested blocks are used, they must be documented on the Project and Drawing Documentation form provided in CHAPTER 5—RESOURCES.

d. Color and pen assignments. Layer colors are used to control pen assignments, which in turn control line thickness on a plotted drawing. Select layer colors in accordance with the Plot Table shown in CHAPTER 5—RESOURCES.

e. Curved entities. Circles, arcs, and ellipses shall be created of one continuous line segment, have to be physically constructed in a segmented fashion. In these cases, curves can be drawn segmented to represent the joints in the actual construction.

f. Dimensioning. All dimensioning shall be associative. Break lines and parts of cut-through views are an exception. Metric dimensions shall conform to the NIBS *Metric Guide for Federal Construction.*

g. Drawing limits. Do not set the limits any larger than necessary to accommodate the drawing. In sheet files, no entities shall be located outside the drawing limits.

h. Drawing origin. Organize drawings in model space so that the lower left intersection of the outermost column lines that remain constant on most of the floors of the building is placed at 0,0,0. In order to ensure proper insertion of Xrefs and stacking of floor plans, the origin point for an entire building must be consistent between model files. Once the origin is established, it cannot be changed. For sheet files, place the lower left corner of the sheet at 0,0.

i. Entity properties. Entity properties such as color and linetype shall be BYLAYER.

j. Graphic standards. Drawing standards and symbology shall be in accordance with the AIA *Graphic Standards.* The Tri-Service CADD/GIS Technology Center is also a good source for drawing symbols, details, and guidelines.

k. Hatching. Do not use polylines with increased width for poché or hatching. Use hatching sparingly as large hatched areas increase the file size of a drawing.

l. Layers. PBS has adopted and contractors must use the long layer name format specified by the AIA. This format is described in the AIA *CAD Layer Guidelines* and includes:

(1) Discipline designator. Discipline designators are a two-character field. The first character distinguishes the discipline; the second is usually a hyphen.

(2) Major group. Major groups are a four-character field that identifies the building system.

(3) Minor group. Minor groups add an additional set of information to layer names. This optional, four-character field differentiates major groups.

(4) Status. As defined by the *U.S. National CAD Standard,* a single letter that designates the status or phase of construction (previously defined as a four letter status field in the *AIA CAD Layer Guidelines*). These include (with the previous status field noted in brackets):

N	New work [NEWW]
E	Existing to remain [EXST]
D	Existing to demolish [DEMO]
F	Future work [FUTR]
T	Temporary work [TEMP]
M	Items to be moved [MOVE]
R	Relocated items [RELO]
X	Not in contract [NICN]
PHS1-9	Phase numbers

Note: Use of a status letter is optional. Layers representing the dominant construction phase can be represented without it. For example, in a small remodeling project, N would indicate new construction and layers without a status letter would indicate existing to remain. The status letter is always the last letter in the layer name. Its location varies depending on project complexity, for example, A-WALL-D or A-WALL-TENT-D. Some Regional CIFM Program Managers may prefer and request use of the previous four-character status field.

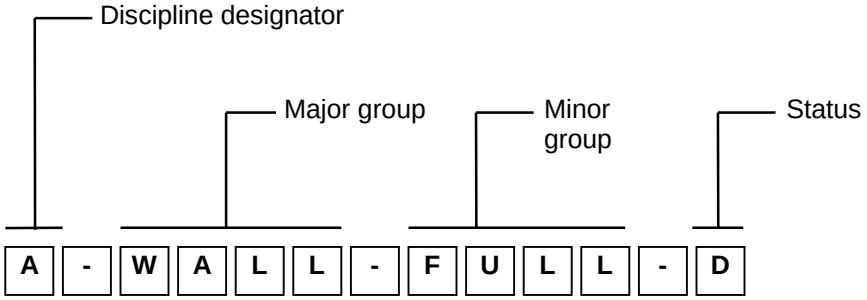


Figure 3-4. Layer name format.

(5) AIA master layer list. As stated, PBS has adopted AIA layer naming conventions. The NIBS *U.S. National CAD Standards* (first edition) and AIA *CAD Layer Guidelines* (second edition 1997) contain the AIA master layer list that contractors must follow. As the list is copyrighted, contractors must refer to or purchase either publication. However, the NCS adds to, modifies, and deletes a number of layer names form the AIA master layer list.

Note: The AIA master layer list allows different layer names for the same information such as A-COLS, I-COLS, and S-COLS. PBS does not allow the use of duplicate names. For example, columns should always be placed on the structural layer (S-COLS), lighting should always be placed on the electrical layer (E-LITE), and plumbing fixtures should always be placed on the plumbing layer (P-FIXT). When in doubt, check with the Regional CIFM Program Manager. The following list includes PBS defined additions to the AIA master layer list:

PBS DEFINED ADDITIONS TO AIA MASTER LAYER LIST	
LAYER NAME	LAYER DESCRIPTION
	ANNOTATION
*-ANNO-TTLB-THIN	Border and title block thin lines 0.18 mm / 0.007 inch
*-ANNO-TTLB-MEDM	Border and title block medium lines 0.25 mm / 0.010 inch
*-ANNO-TTLB-MEDT	Border and title block medium thick lines 0.35 mm / 0.014 inch
*-ANNO-TTLB-THIK	Border and title block thick lines 0.50 mm / 0.020 inch
*-ANNO-TTLB-XTHK	Border and title block extra thick lines 0.70 mm / 0.028 inch
*-ANNO-TTLB-OPTI	Border and title block optional lines 1.00 mm / 040 inch
	GENERAL
G-XREF	Reference files (base *.dwg in model space/title block in paper space)
G-PLAN-KEYP	Floor plan - key plan
	CIVIL
C-BLDG-OTLN	Building footprint, outline
C-BLDG-IDEN	Building annotations
	STRUCTURAL
S-COLS-ENCL	Column enclosure
	ARCHITECTURAL
A-WALL-CNTR	Wall centerlines
A-WALL-SHEL	Core and exterior shell walls
A-WALL-CORR	Corridor walls
A-WALL-TENT	Interior tenant walls
A-DOOR-SHEL	Core and exterior shell doors
A-DOOR-CORR	Corridor doors
A-DOOR-TENT	Interior tenant doors
A-GLAZ-SHEL	Core and exterior shell glazing
A-GLAZ-CORR	Corridor glazing
A-GLAZ-TENT	Interior tenant glazing
A-CLNG-SPCL	Ceiling mounted specialties (i.e. clocks, fans, etc.)
A-ROOF-CRTS	Crickets, flow arrows
A-ROOF-WALK	Walkways
A-ROOF-SPCL	Roof specialties, accessories
	ELECTRICAL
E-EQPM	Security equipment
E-SERT-ZONE	Security zone
E-SERT-PATT	Security zone hatching
	PLUMBING
P-FIXT-SHEL	Plumbing fixtures
P-FIXT-TENT	Tenant plumbing fixtures
	MECHANICAL
M-HVAC-EXHT	Exhaust system ductwork
	OTHER DISCIPLINES (HISTORICAL)
X-HIST-IDEN	Historical annotations
X-HIST-ZONE	Historical zone outlines
X-HIST-PATT	Historical zone hatching

m. Linetypes.

(1) Use only standard AutoCAD linetypes. Contour lines, dashed lines, and other fonted lines shall be made of one continuous line segment, not a series of separate line segments.

(2) Polylines with increased width may be used to depict non-building elements such as cut-lines or title block borders, for all other building elements requiring bold lines, use variations in pen thickness, not thick polylines. Use of toned or pochéd lines is acceptable for distinguishing various types of work, such as new from existing or phase 1 from phase 2.

n. Objects. Some AEC software packages now use object technology. These packages must comply with the PBS CAD Standards. The International Alliance for Interoperability (IAI) is responsible for standardization of language for communicating this technology between vendors.

o. Scale. Create drawing entities full size, for example, a 100-foot wall will be drawn to 100 feet and a 36-inch column will be drawn to 36 inches. Drawings considered schematic in nature may be drawn to any scale. Some examples of schematic drawings are schedules, riser diagrams, schematic diagrams, and single line diagrams.

p. Plan drawings. Create plan drawings in a single model file per floor plan. Do not combine different floors within one model file. Do not combine non-plan information (such as elevations, sections, and details) with plans in the plan model file. When a floor plan is too large to fit on a single sheet at the desired scale use viewports in separate sheet files to show portions of the floor. DO NOT create individual model files for portions of a floor.

q. Text and fonts. Use only standard AutoCAD fonts. The minimum plotted text size for all drawings shall be 3/32". For clarity and presentation purposes it may be necessary to use other text sizes. Charts to aid in calculating text height for both Metric and Imperial units are shown in CHAPTER 5—RESOURCES.

r. Units. Metric units shall be the standard system of measurement for new facilities unless otherwise specified. All measurements shall conform to the NIBS *Metric Guide for Federal Construction*. Imperial units may be used for projects in existing buildings when existing drawings are Imperial.

s. Xrefs.

(1) Use Xrefs to subdivide CAD drawings into several smaller, more efficient drawings. This will reduce drawing size, increase performance, improve operator efficiency, and make coordination of disciplines easier. Xrefs may also be used to split a drawing by disciplines.

(2) Organize Xref'd information in logical fashion. Do not combine plans with other types of information (elevations, details, etc.) within the same model file. If details are Xref'd, do not combine details intended to be printed at different scales within the same model file.

(3) Verify that Xref links do not reference a drive letter or directory. Document Xref names and relationships in the Deliverables Matrix provided in CHAPTER 5—RESOURCES.

3. Submission requirements.

a. Drawing settings.

(1) Open the drawing and zoom extents. Delete entities outside the drawing limits.
(2) Purge all blocks, layers, etc. NOT REFERENCED in the drawing.
(3) Verify that all Xrefs are attached without drive or directory specifications.
(4) Set the menu to the standard AutoCAD menu.
(5) Scan all files for viruses.
(6) Verify that AutoCAD variable settings are set as follows:

Variable	Setting	Variable	Setting
BASE	Insertion base point (0,0,0).	POINT	Display mode 0, size 0.0.
BLIPMODE	Off.	QTEXT	Off.
GRID	Off.	SNAP	Off.
ISAVEPERCENT	0, ensures every SAVE is a full SAVE.	TEXT	Style STANDARD.
LAYER	Current layer is 0.	TILEMODE	1 (Model Space) for model files. 0 (Paper Space) for sheet files.
LIMITS	Off, drawing limits to drawing size.	UCS	Current UCS same as World, Origin at World (0,0,0), auto plan view off, coordinate system icon on (at origin).
LINETYPE	Current entity linetype BYLAYER. Current linetype CONTINUOUS.	UNITS (linear)	As appropriate for drawing.
MENU	Standard AutoCAD.	UNITS (angular)	Decimal degrees (surveyor's units for civil drawings).
PDMODE	0, controls how point objects are displayed.	ZOOM	To drawing extents.
PDSIZE	0, sets the display size for point objects.		

b. The contractor is responsible for ensuring that all submissions (including those of any subcontractors) meet the PBS deliverable standards. Sample files may be requested to insure compliance with PBS standards.

c. Submit drawing files to PBS either on CD-ROMs or electronically. The Regional CIFM Program Manager shall specify which on a project by project basis, or approve any exceptions.

d. Labeling of media. Include on all media the following:

Building name, number, and address
PBS project name and number (This information will be provided by PBS.)
Contractor name, contact name and telephone number
PBS project manager name
Date of submittal
Description of contents
Disk number and sequence (if applicable)

e. Supplementary information.

(1) All final submittals must be accompanied by a Project Drawing and Documentation Report and Deliverables Matrix (available from PBS in electronic format). See CHAPTER 5—RESOURCES.

(2) To comply with PBS security requirements, each drawing must be labeled or stamped "FOR OFFICIAL USE ONLY."

4. Plotting standards.

a. Color and line width. The following guide is from the U.S. Coast Guard Plotting Guidelines. Shaded areas indicate color difficult to read against a black display.

AutoCAD color no.	Pen plotter pen (mm)	Laser/ink-jet (in.)	Plot color
1	0.18	0.007	Black
2	0.25	0.010	Black
3	0.35	0.014	Black
4	0.35	0.014	Black
5	0.50	0.020	Black
6	0.70	0.028	Black
7	0.25	0.010	Black
8	0.35	0.014	Halftone
9	1.00	0.040	Black
10	0.25	0.010	Black
11	0.35	0.014	Black
12	0.50	0.020	Black
13	0.70	0.028	Black
14	1.00	0.040	Black
15	0.50	0.020	Black
16	0.70	0.028	Black
17	0.70	0.028	Halftone
18	0.35	0.014	Halftone
19	1.00	0.040	Black
20	0.18	0.007	Rust
21	0.25	0.010	Rust
22	0.35	0.014	Rust
23	0.50	0.020	Rust
24	0.70	0.028	Rust
25	1.00	0.040	Rust
26	0.70	0.028	Rust
27	0.70	0.028	Rust
28	0.35	0.014	Rust
29	1.00	0.040	Rust
30	0.18	0.007	Black
31	0.25	0.010	Black
32	0.35	0.014	Black
33	0.50	0.020	Black
34	0.70	0.028	Black
35	1.00	0.040	Black
36	0.70	0.028	Black
37	0.70	0.028	Halftone
38	0.35	0.014	Halftone
39	1.00	0.040	Black

AutoCAD Color No.	Pen plotter pen (mm)	Laser/ink-jet (in.)	Plot color
40	0.18	0.007	Gold
41	0.25	0.010	Gold
42	0.35	0.014	Gold
43	0.50	0.020	Gold
44	0.70	0.028	Gold
45	1.00	0.040	Gold
46	0.70	0.028	Gold
47	0.70	0.028	Gold
48	0.35	0.014	Gold
49	1.00	0.040	Gold
50	0.18	0.007	Black
51	0.25	0.010	Black
52	0.35	0.014	Black
53	0.50	0.020	Black
54	0.70	0.028	Black
55	1.00	0.040	Black
56	0.70	0.028	Black
57	0.70	0.028	Halftone
58	0.35	0.014	Halftone
59	1.00	0.040	Black
60	0.18	0.007	Olive
61	0.25	0.010	Olive
62	0.35	0.014	Olive
63	0.50	0.020	Olive
64	0.70	0.028	Olive
65	1.00	0.040	Olive
66	0.70	0.028	Olive
67	0.70	0.028	Olive
68	0.35	0.014	Olive
69	1.00	0.040	Olive
70	0.18	0.007	Black
71	0.25	0.010	Black
72	0.35	0.014	Black
73	0.50	0.020	Black
74	0.70	0.028	Black
75	1.00	0.040	Black
76	0.70	0.028	Black
77	0.70	0.028	Halftone
78	0.35	0.014	Halftone
79	1.00	0.040	Black

AutoCAD color no.	Pen plotter pen (mm)	Laser/ink-jet (in.)	Plot color
80	0.18	0.007	Green
81	0.25	0.010	Green
82	0.35	0.014	Green
83	0.50	0.020	Green
84	0.70	0.028	Green
85	1.00	0.040	Green
86	0.70	0.028	Green
87	0.70	0.028	Green
88	0.35	0.014	Green
89	1.00	0.040	Green
90	0.18	0.007	Black
91	0.25	0.010	Black
92	0.35	0.014	Black
93	0.50	0.020	Black
94	0.70	0.028	Black
95	1.00	0.040	Black
96	0.70	0.028	Black
97	0.70	0.028	Halftone
98	0.35	0.014	Halftone
99	1.00	0.040	Black
100	0.18	0.007	Forest
101	0.25	0.010	Forest
102	0.35	0.014	Forest
103	0.50	0.020	Forest
104	0.70	0.028	Forest
105	1.00	0.040	Forest
106	0.70	0.028	Forest
107	0.70	0.028	Forest
108	0.35	0.014	Forest
109	1.00	0.040	Forest
110	0.18	0.007	Black
111	0.25	0.010	Black
112	0.35	0.014	Black
113	0.50	0.020	Black
114	0.70	0.028	Black
115	1.00	0.040	Black
116	0.70	0.028	Black
117	0.70	0.028	Halftone
118	0.35	0.014	Halftone
119	1.00	0.040	Black
120	0.18	0.007	Teal
121	0.25	0.010	Teal
122	0.35	0.014	Teal
123	0.50	0.020	Teal
124	0.70	0.028	Teal
125	1.00	0.040	Teal
126	0.70	0.028	Teal
127	0.70	0.028	Teal
128	0.35	0.014	Teal
129	1.00	0.040	Teal

AutoCAD color no.	Pen plotter pen (mm)	Laser/ink-jet (in.)	Plot color
130	0.18	0.007	Black
131	0.25	0.010	Black
132	0.35	0.014	Black
133	0.50	0.020	Black
134	0.70	0.028	Black
135	1.00	0.040	Black
136	0.70	0.028	Black
137	0.70	0.028	Halftone
138	0.35	0.014	Halftone
139	1.00	0.040	Black
140	0.18	0.007	Cyan
141	0.25	0.010	Cyan
142	0.35	0.014	Cyan
143	0.50	0.020	Cyan
144	0.70	0.028	Cyan
145	1.00	0.040	Cyan
146	0.70	0.028	Cyan
147	0.70	0.028	Cyan
148	0.35	0.014	Cyan
149	1.00	0.040	Cyan
150	0.18	0.007	Black
151	0.25	0.010	Black
152	0.35	0.014	Black
153	0.50	0.020	Black
154	0.70	0.028	Black
155	1.00	0.040	Black
156	0.70	0.028	Black
157	0.70	0.028	Halftone
158	0.35	0.014	Halftone
159	1.00	0.040	Black
160	0.18	0.007	Blue
161	0.25	0.010	Blue
162	0.35	0.014	Blue
163	0.50	0.020	Blue
164	0.70	0.028	Blue
165	1.00	0.040	Blue
166	0.70	0.028	Blue
167	0.70	0.028	Blue
168	0.35	0.014	Blue
169	1.00	0.040	Blue
170	0.18	0.007	Black
171	0.25	0.010	Black
172	0.35	0.014	Black
173	0.50	0.020	Black
174	0.70	0.028	Black
175	1.00	0.040	Black
176	0.70	0.028	Black
177	0.70	0.028	Halftone
178	0.35	0.014	Halftone
179	1.00	0.040	Black

AutoCAD color no.	Pen plotter pen (mm)	Laser/ink-jet (in.)	Plot color
180	0.18	0.007	Navy
181	0.25	0.010	Navy
182	0.35	0.014	Navy
183	0.50	0.020	Navy
184	0.70	0.028	Navy
185	1.00	0.040	Navy
186	0.70	0.028	Navy
187	0.70	0.028	Navy
188	0.35	0.014	Navy
189	1.00	0.040	Navy
190	0.18	0.007	Black
191	0.25	0.010	Black
192	0.35	0.014	Black
193	0.50	0.020	Black
194	0.70	0.028	Black
195	1.00	0.040	Black
196	0.70	0.028	Black
197	0.70	0.028	Halftone
198	0.35	0.014	Halftone
199	1.00	0.040	Black
200	0.18	0.007	Purple
201	0.25	0.010	Purple
202	0.35	0.014	Purple
203	0.50	0.020	Purple
204	0.70	0.028	Purple
205	1.00	0.040	Purple
206	0.70	0.028	Purple
207	0.70	0.028	Purple
208	0.35	0.014	Purple
209	1.00	0.040	Purple
210	0.18	0.007	Black
211	0.25	0.010	Black
212	0.35	0.014	Black
213	0.50	0.020	Black
214	0.70	0.028	Black
215	1.00	0.040	Black
216	0.70	0.028	Black
217	0.70	0.028	Halftone
218	0.35	0.014	Halftone
219	1.00	0.040	Black

AutoCAD color no.	Pen plotter pen (mm)	Laser/ink-jet (in.)	Plot color
220	0.18	0.007	Magenta
221	0.25	0.010	Magenta
222	0.35	0.014	Magenta
223	0.50	0.020	Magenta
224	0.70	0.028	Magenta
225	1.00	0.040	Magenta
226	0.70	0.028	Magenta
227	0.70	0.028	Magenta
228	0.35	0.014	Magenta
229	1.00	0.040	Magenta
230	0.18	0.007	Black
231	0.25	0.010	Black
232	0.35	0.014	Black
233	0.50	0.020	Black
234	0.70	0.028	Black
235	1.00	0.040	Black
236	0.70	0.028	Black
237	0.70	0.028	Halftone
238	0.35	0.014	Halftone
239	1.00	0.040	Black
240	0.18	0.007	Red
241	0.25	0.010	Red
242	0.35	0.014	Red
243	0.50	0.020	Red
244	0.70	0.028	Red
245	1.00	0.040	Red
246	0.70	0.028	Red
247	0.70	0.028	Red
248	0.35	0.014	Red
249	1.00	0.040	Red
250	0.25	0.010	Halftone
251	0.35	0.014	Halftone
252	0.50	0.020	Halftone
253	0.70	0.028	Halftone
254	1.00	0.040	Halftone
255	1.00	0.040	Black

b. Line width. Use different line weights to improve drawing readability.

LINE WEIGHT	LINE THICKNESS	LAYER NAME*	DESCRIPTION
Thin	0.18 mm/ 0.007 in.	THIN	Dimension leaders/ witness lines, dimension lines, object lines seen in the distance, and most patterns.
Medium	0.25 mm/ 0.010 in.	MEDM	Minor object lines, line terminators (arrowheads and ticks), hidden lines, and note leader lines.
Medium thick	0.35 mm/ 0.014 in.	MEDT	Most object lines, text, schedule boxes, and charts.
Thick	0.50 mm/ 0.020 in.	THIK	Minor title underlining, title text, object lines requiring special emphasis.
Extra thick	0.70 mm/ 0.028 in.	XTHK	Use sparingly for underlining titles and separating portions of drawings, elevation grade lines, building footprints, and top of grade markings.
Optional	1.00 mm/ 0.040 in.	OPTI	
			* Layer name modifier to use when layers are separated by line weights such as title blocks and details.

c. Plotting sheet sizes and scales.

Metric

Size	Horizontal dimension		Vertical dimension	
A0	1 190 mm	(48”)	840 mm	(36”)
A1	840 mm	(36”)	595 mm	(24”)
A2	595 mm	(24”)	420 mm	(18”)
A3	420 mm	(18”)	295 mm	(12”)
A4	280 mm	(11 ½”)	216 mm	(8”)

Note: Drawing scale and plot scale are equal (1:100 = 1/100).

Imperial

Architectural scales		Civil scales	
Drawing scale	Plot scale	Drawing scale	Plot scale
1/16" = 1'-0"	192	1:10	120
1/8" = 1'-0"	96	1:20	240
1/4" = 1'-0"	48	1:30	360
3/8" = 1'-0"	32	1:40	480
1/2" = 1'-0"	24	1:50	600
3/4" = 1'-0"	16	1:60	720
1" = 1'-0"	12	1:100	1200
1 1/2" = 1'-0"	8	1:200	2400
3" = 1'-0"	4		
6" = 1'-0"	2		
Full size	1		

d. Text height guide.

Metric

Architectural		2mm	3mm	5mm	6mm	12mm	24mm
1:200	Text Height =	400mm	600mm	1000mm	1200mm	2400mm	4800mm
1:100	Text Height =	200mm	300mm	500mm	600mm	1200mm	2400mm
1:50	Text Height =	100mm	150mm	250mm	300mm	600mm	1200mm
1:25	Text Height =	50mm	75mm	125mm	150mm	300mm	600mm
1:10	Text Height =	20mm	30mm	50mm	60mm	120mm	240mm
1:5	Text Height =	10mm	15mm	25mm	30mm	60mm	120mm
1:1	Text Height =	2mm	3mm	5mm	6mm	12mm	24mm

Imperial

Architectural		1/16"	3/32"	1/8"	5/32"	3/16"	1/4"	3/8"	1/2"
1/32"=1'-0"	Text Height =	2'	3'	4'	5’	6'	8'	12'	16'
1/16"=1'-0"	Text Height =	1'	1'-6"	2'	2’-6”	3'	4'	6'	8'
3/32"=1'-0"	Text Height =	9"	1'-1.5"	1'-6"	1’-8”	2'-3"	3'	4'-6"	6'
1/8"=1'-0"	Text Height =	6"	9"	1'	1’-3”	1'-6"	2'	3'	4'
¼"=1'-0"	Text Height =	3"	4.5"	6"	7.5”	9"	1'	1'-6"	2'
3/8"=1'-0"	Text Height =	2"	3"	4"	5”	6"	8"	1'	1'-4"
½"=1'-0"	Text Height =	1.5"	2.25"	3"	3.75”	4.5"	6"	9"	1'
¾"=1'-0"	Text Height =	1"	1.5"	2"	2.5”	3"	4"	6"	8"
1"=1'-0"	Text Height =	.75"	1.13"	1.5"	1.875”	2.25"	3"	4.5"	6"
1 1/2"=1'-0"	Text Height =	.5"	.75"	1"	1.25”	1.5"	2"	3"	4"
3"=1'-0"	Text Height =	.25"	.38"	.5"	0.625’	.75"	1"	1.5"	2"

CHAPTER 4
ASSIGNMENT DRAWINGS

1. Definition of project and facility drawings. There are two major categories of PBS drawings. These are project drawings and facility drawings.

   a. Project drawings are created for a specific project (whether it be construction or furniture relocation) that has a definitive beginning and end. Design intent drawings would fall under the category of project drawings. Once the project is complete, the drawings may be updated to reflect as-built conditions and incorporate amendments and change orders. However, the drawings themselves essentially become history. They are a record of something that happened in the past. Portions of project drawings may be used to update facility drawings.

   b. Facility drawings reflect the current condition of a building or facility, and by their very nature are living documents that are continually updated. Assignment drawings are a specific type of facility drawing, and are required for every building PBS owns or leases.

2. Assignment drawing standards.

   a. When PBS requests submission of assignment drawings and data, contractors must follow the direction given in the *PBS Assignment Drawing Guidance*. Note: The *PBS Assignment Drawing Guidance* is FOR ASSIGNMENT DRAWING SUBMITTALS ONLY. Where discrepancies exist between it and the *PBS CAD Standards*, the Guidance rules.

   b. PBS has adopted the *Standard Method for Measuring Floor Area in Office Buildings, ANSI/BOMA Z65.1-1996*. Contractors preparing assignment drawings for PBS should also refer to or obtain a copy of the ANSI/BOMA Standard. See CHAPTER 5—RESOURCES for the address.

CHAPTER 5
RESOURCES

1. Organizational addresses.

American Institute of Architects
(CAD Layer Guidelines)
1735 New York Avenue NW
Washington, DC 20006-5292
Voice (202) 626-7300
Orders (800) 365-2724
Fax (802) 864-7626
Email aia@aia.org
Internet http://www.aia.org

The Construction Specifications Institute
(Uniform Drawing System)
601 Madison Street
Alexandria, VA 22314-1791
Voice (800) 689-2900
Fax (703) 684-0465
Email csimail@csinet.org
Internet http://www.csinet.org

National Institute of Building Sciences
(Metric Guide for Federal Construction, U.S. National CAD Standard)
1090 Vermont Avenue NW, Suite 700
Washington, DC 20005-4905
Voice (202) 289-7800
Fax (202) 289-1092
Email nibs@nibs.org
Internet http://www.nibs.org

The CADD/GIS Technology Center for Facilities, Infrastructure, and Environment
(A/E/C CADD Standards)
U.S. Army Engineer Research and Development Center
Waterways Experiment Station,
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
Internet http://tsc.wes.army.mil

U.S. Coast Guard Civil Engineering Technology Center
(National Plotting Guidelines)
1240 East 9th Street, Room 2195
Cleveland, OH 44199-2060
Voice (216) 902-6209
Fax (216) 902-6277
Email pherold@cetc.uscg.mil
Internet http://www.uscg.mil/mlclant/cetc/

International Alliance for Interoperability
(Object Technology)
2960 Chain Bridge Road, Suite 143
Oakton, VA 22124-3018
Voice (703) 255-6505, (800) 798-3375
FAX (203) 255-0546
Internet http://iaiweb.lbl.gov

Building Owners and Managers Association
(Building Measurement)
1201 New York Avenue NW Suite 300
Washington, DC 20005
Voice (202) 408-2662
FAX (202) 371-0181
Internet http://www.boma.org

American National Standards Institute (ANSI)
11 West 42nd Street, 13th Floor
New York, New York 10036
Voice (212) 642-4900
Fax (212) 398-0023
Email ansionline@ansi.org
Internet http://www.ansi.org

2. Project and drawing documentation.

PROJECT NAME - PROJECT LOCATION					GSA ***PCN
PROJECT AND DRAWING DOCUMENTATION REPORT					BUILDING NO
Building Name	xxxxx	GSA Contact	xxxx		
Building Address	xxxxx	GSA Contact Phone	xxxx		
A/E Name	xxxxx				
Work Order No.	xxxxx	CAD software/version	xxxx		
A/E Contact	xxxxx	Third party software/version*	xxxx		
A/E Contact Phone	xxxxx	Virus scanning software/version	xxxx		
SCRIPT FILES		NON AUTOCAD ENTITIES*			
File name	Description	Fonts	xxx		
xxxx	xxx	Linetypes	xxx		
		* *Must be pre-approved in writing by the CIFM Program Manager*			
The undersigned certifies the following:					
		All documents comply with PBS CAD Standards			
		All documents comply with Regional Deliverables Policy			
		All electronic files have been scanned, and are virus free			
	Name				
	Title				
	Signature				
	Date				
07/01/99					

3. Deliverables matrix.

PROJECT NAME - PROJECT LOCATION						GSA ***PCN
DELIVERABLES MATRIX						BUILDING NO
Building Name	xxxxx		GSA Contact	xxxx		
Building Address	xxxxx		GSA Contact Phone	xxxx		
			Sheet Size	xxxx		
A/E name	xxxxx		File Format	xxxx		
Work order no.	xxxxx		No of Files	xxxx		
A/E contact	xxxxx		Total File Volume	xxxx		
A/E contact phone	xxxxx		Date	xxxx		
SHEET	NO/TOTAL	SHEET TITLE	FILE NAME	XREFS FILE NAMES	PLOT SCALE	SUBJECT
G-001	1/22	COVER SHEET	G-001.dwg		1=1	Plot Sheet
				G-SP.dwg		Vicinity Plan
G-002	2/22	SYMBOLS & ABBREVIATIONS	G-002.dwg		1=1	Plot Sheet
A-101	3/22	EAST ENTRY REMODEL PLAN	A-101.dwg		1=1	Plot Sheet
				A-FP01.dwg		1st Floor plan & demo plan
				A-DT014a.dwg		1/4" Drawings
A-501	4/22	DETAILS	A-501.dwg		1=1	Plot Sheet
				A-DT034a.dwg		3/4" Details
				A-DT112a.dwg		1 1/2" Details
				A-DT300a.dwg		3" Details
A-502	5/22	DETAILS	A-502.dwg		1=1	Plot Sheet
				A-DT014b.dwg		1/4" Details
				A-DT112b.dwg		1 1/2" Details
L-101	6/22	EXISTING SITE CONDITIONS	L-101.dwg		1=1	Plot Sheet
				L-SP.dwg		Exist. Site Information
				L-SH.dwg		Landscape Legend
				G-SH.dwg		Detail Box Background
				C-UPsan.dwg		San. Sewer Plan
				C-UPssw.dwg		Storm Sewer Plan
				C-UPwat.dwg		Water Utility Plan
L-102	7/22	SITE DEMOLITION	L-102.dwg		1=1	Plot Sheet
				L-SP.dwg		Exist. Site Information
				L-DP.dwg		Site Demolition plan
				G-SH.dwg		Detail Box Background
				L-SPa.dwg		Limits of Construction Plan
				L-SHa.dwg		Landscape Notes

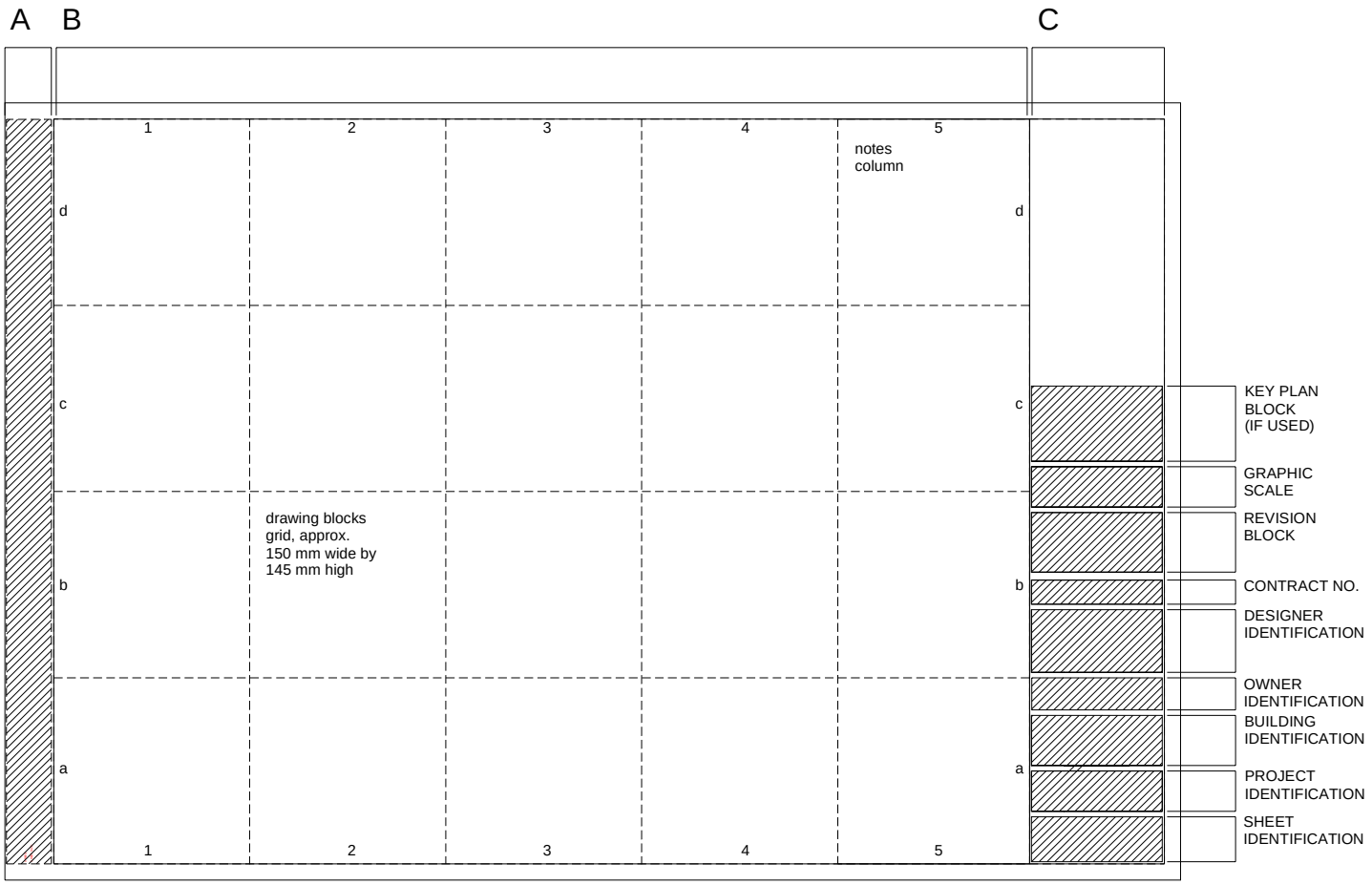
4. Deviation request.

PROJECT NAME - PROJECT LOCATION					GSA ***PCN
DEVIATION REQUEST					BUILDING NO
Building Name	xxxxx		GSA Contact	xxxx	
Building Address	xxxxx		GSA Contact Phone	xxxx	
A/E Name	xxxxx				
Work Order No.	xxxxx		CAD software/version	xxxx	
A/E Contact	xxxxx				
A/E Contact Phone	xxxxx		Date	xxxx	
1	CHAPTER ____, paragraph ____, page ____.				
	Reason:				
	Approved:	DATE	Disapproved:	DATE	
2	CHAPTER ____, paragraph ____, page ____.				
	Reason:				
	Approved:	DATE	Disapproved:	DATE	
3	CHAPTER ____, paragraph ____, page ____.				
	Reason:				
	Approved:	DATE	Disapproved:	DATE	
4	CHAPTER ____, paragraph ____, page ____.				
	Reason:				
	Approved:	DATE	Disapproved:	DATE	
					Revised May 5, 1999

5. Sheet layout and title blocks.

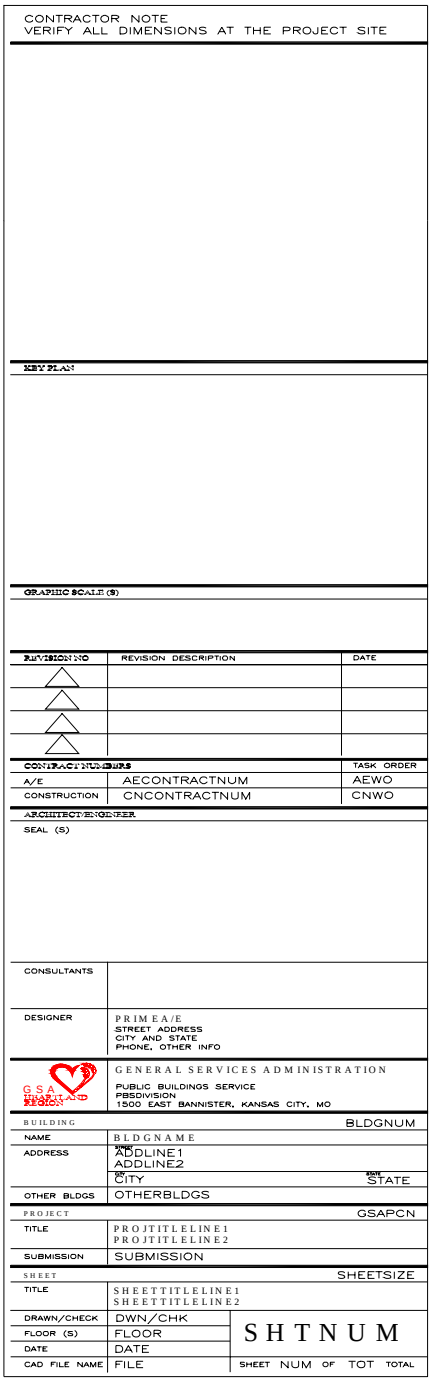
Shematic layout for horizontal sheet with vertical title block

OVERALL SHEET LAYOUT SCHEMATIC
(BASED ON CSI UNIFORM DRAWING SYSTEM)

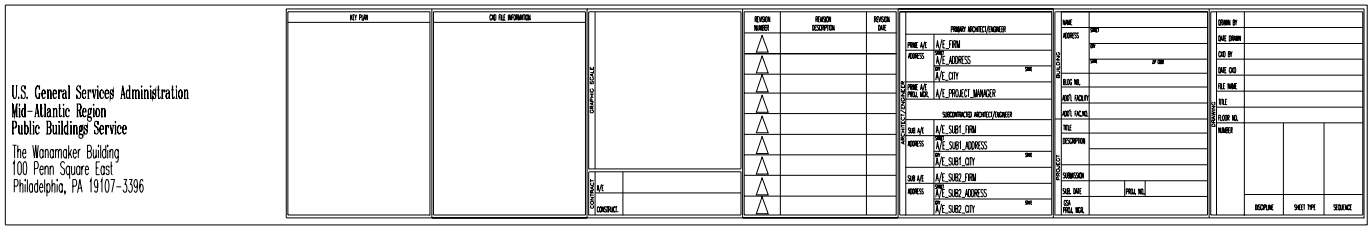


A PRODUCTION DATA/BINDER AREA (optional)
B DRAWING AREA
C TITLE BLOCK AREA

Sample vertical title block



Sample horizontal title block (optional)



Model file attribute block (include on all model files since they do not have title blocks)

BUILDING NAME: BLDG_NAME

BUILDING NUMBER: BLDG#

STREET ADDRESS: STREET

CITY, STATE: CITY,STATE

PROJECT INFORMATION

PROJECT DESCRIPTION: PROJ_DESCRIPTION

PROJECT NUMBER: PROJ_NUMBER

DRAWING DESCRIPTION: DWG_DESCRIPTON

FLOOR NUMBER (if applicable): FLOOR#

DRAFTER INFORMATION

COMPANY NAME: COMPANY_NAME

CONTACT PERSON & PHONE #: CONTACT_&_PHONE#

FILE NAME: FILE_NAME

DATE: DWG_DATE

6. Units and conversion guide.

Comparison of drawing scales

Inch-foot scales	Inch-foot ratio	Metric scale
Full Size	1:1	1:1
Half Size	1:2	1:2
4" = 1'-0"	1:3	
3" = 1'-0"	1:4	1:5
2" = 1'-0"	1:6	
1-1/2" = 1'-0"	1:8	1:10
1" = 1'-0"	1:12	
¾" = 1'-0"	1:16	1:20
½" = 1'-0"	1:24	1:25
¼" = 1'-0"	1:48	1:50
1" = 5'-0"	1:60	
1/8" = 1'-0"	1:96	1:100
1" = 10'-0"	1:120	
1/16" = 1'-0"	1:192	1:200
1" = 20'-0"	1:240	1:250
1" = 30'-0"	1:360	
1/32" = 1'-0"	1:384	
1" = 40'-0"	1:480	1:500
1" = 50'-0"	1:600	
1" = 60'-0"	1:720	
1" = 80'-0"	1:960	1:1000

Conversion factors

Quantity	From inch-pound units	To metric units	Multiply by
Length	mile	km	1.609 344*
	yard	m	0.914 4*
	foot	m	0.304 8*
		mm	304.8*
	inch	mm	25.4*
Area	square mile	km^2	2.590 00
	acre	m^2	4 046.87
		ha (10 000m^2)	0.404 687
	square yard	m^2	0.836 127 36*
	square foot	m^2	0.092 903 04*
	square inch	mm^2	645.16*

*Denotes the exact conversion

CHAPTER 6
RESERVED FOR REGIONAL REQUIREMENTS

This chapter is reserved for additional regional requirements. Please review with the Regional CIFM Program Manager.